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Studies On Neuromuscular Dysfunction, XIII: New Concepts and Techniques of Neuromuscular Reeduction For Paralysis

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PART I

In patients with paralysis, we are usually dealing with a permanent disability as a residual of disease or injury of a part of the neuromuscular mechanism. In poliomyelitis, for example, the virus infection invades the spinal cord and permanently destroys some of the motor neurons. These neurons degenerate and the muscle fibers they innervate undergo atrophy.

The objectives in treatment of any type of paralysis are to: (1) Obtain the fullest possible recovery of motor function, and (2) Reduce the disability to a minimum.

After a sufficient trial of treatment for recovery of motor function, it may be evident that recovery is insufficient and serious disability will remain. Further practical gain in reduction of disability may then be achieved in some cases through appliances or surgery.

Recovery of motor function occurs spontaneously in certain paralytic conditions. In acute poliomyelitis, for example, as the infection subsides, motor recovery occurs from decrease in inflammation and edema and from restoration of function in neurons which were not destroyed by the virus. In hemiplegia from cerebral hemorrhage or thrombosis, spontaneous improvement in motor function occurs after recovery from the shock of the injury, and from subsidence of the edema and inflammation. In addition, however, spontaneous motor restoration appears to result from a process of compensation by which extrapyramidal pathways take over function from the damaged corticospinal tract.[1]

Factors Influencing Treatment of Paralysis In Poliomyelitis

Everyone agrees that a destroyed motor neuron in the anterior horn of the spinal cord is lost permanently, since no regeneration of nerve cells is possible after birth. The muscle fibers which were innervated by that motor neuron undergo atrophy and degeneration and eventually disappear to be replaced by fat or fibrous tissue. No therapy directed at the denervated muscle fibers or the destroyed anterior cell will have any effect in restoring voluntary motion. Spontaneous recovery from the virus infection of polimyelitis renders motor nerve cells, which were damaged but not destroyed, again potentially capable of function. In fact, in our present state of knowledge of poliomyelitis, it is unfortunately true that the whole course of this neurogenic virus infection is beyond the control or influence of the physician. He can neither prevent the disease, nor prevent or influence the virus attack on the spinal cord and its permanent destructive residuals; nor, as far as we know, directly influence or control the process of recovery in the infected nerve cells. What, then, is the rationale of applying treatment to restore motor function in poliomyelitis if the process is occurring spontaneously without treatment and if there is no known method of influencing the subsidence of the spinal cord pathology? In fact, Sherman[2] came to the conclusion that treatment did not contribute to recovery of motor function in poliomyelitis, since the results were identical in the treated and untreated groups. This result can best be explained by the ineffectiveness of the particular treatment program applied in these cases. In contrast, almost all other specialists believe that treatment has a very important place in recovery of motor function in poliomyelitis.

Effective treatment is essential to restore function more completely in poliomyelitis even though spontaneous return of motor function is associated with the recovery of the spinal cord from the virus invasion. Treatment can also greatly accelerate motor recovery and render the utilization of the residual muscular power more efficient. The rationale of treatment for restoration of motor function in poliomyelitis is based on the following factors:

1. *Hypertrophy.* Muscular power can be increased by hypertrophy of the muscle fibers. It is well known that heavy work causes muscular hypertrophy associated with marked increase in power and endurance. In poliomyelitis, the innervated muscle fibers can be strengthened as much as possible by hypertrophy, thereby reducing the power deficit of the muscle resulting from loss of some of its muscle fibers through denervation.

2. *Preventing Disuse.* During the long period of spontaneous recovery, the patient without treatment

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would usually be extremely disinclined to use his paralyzed neuromuscular system. Being unable to walk, the actual daily exercise engaged in by the affected lower extremities would be negligible. For this reason, a secondary drain on motor function is established, which, superimposed on the original organic pathology, renders motor recovery more difficult and may even cause further progressive loss of function. The loss from disuse is not only in atrophy of the inactive muscle fibers, and greater weakness and fatigability of muscles, but also in severe decline in function of the complex mechanisms in the central nervous system for initiation, control and coordination of voluntary motion.

The voluntary motor system is not static but is a highly dynamic mechanism continuously undergoing improvement or decline in function depending on the quantity of activity in the various patterns of motion. Continued activity is essential to maintain the power, range of motion, endurance and coordination of the neuromuscular mechanisms. Also, an adequate level of daily activity is required for each specific motion and group of muscles, since activity in one neuromuscular pattern that excites one group of muscles will contribute to preventing decline of function from disuse in that specific muscle group only, but will have no influence on the process of disuse in another muscle group. Just as complete inactivity of a particular muscle produces loss of function and disuse atrophy more rapidly than mere restriction of activity, so motor function is improved and the muscle hypertrophies more rapidly the more intensive the daily activity of the muscle.

3. *Development of correct motor patterns.* Patients attempting by themselves to regain the ability to perform complex practical activities in spite of paralysis often run into difficulties because of the development of abnormal patterns of motion which become habitual. The nervous system definitely functions on the principle of taking the path of least resistance. If the hip flexors are very weak and fatigue rapidly, the patient in attempting to walk will develop a pattern of elevation of the pelvis, using the quadratus lumborum instead of flexing the hip. This is because the synaptic resistance is less in the voluntary motor pathway to the less affected quadratus than to the more paralyzed iliopsoas muscle and the nerve impulses selectively traverse the more available central pathways. As this abnormal pattern becomes habitual, walking will induce no activity in the hip flexors, since hip flexion is excluded from the pattern. The weak hip flexors become weaker and eventually may be completely paralyzed from disuse. Even if gradual spontaneous recovery of the innervation of the hip flexors from subsidence of spinal pathology would have occurred, the abnormal habit pattern may have become so strongly entrenched by that time that the hip flexors will still be excluded from the gait pattern and therefore continue to undergo loss of function from inactivity.

In addition to allowing substitution of stronger for weaker muscles and thereby producing disuse atrophy in the weaker group, abnormal habit patterns have other undersirable consequences. They may progressively strengthen one group of muscles through overuse and weaken another group through disuse, thus increasing muscle imbalance and producing progressive deformity. This is particularly serious in the complex trunk muscles, where progressive deformity of the spine may continue over a period of years associated with progressive muscle imbalance from abnormal habit patterns. It is difficult to explain the frequently observed gradual progression of deformity, weakness and muscle imbalance as a primary effect of poliomyelitis, since it is well known that progression of neuromuscular involvement from the virus attack never occurs after the acute stage. Gradual progression of deformity is easily understood, however, as a secondary phenomenon resulting from abnormal habit patterns.

Training of new patterns of motion and new skills is dependent on formation of new functional pathways in the central nervous system, with resistance at the synapses in these pathways decreasing progressively through repetitive activity. Training of a motor skill requires that all of the essential motions which are combined in the new central pathway be carried out in the same pattern many times. Development of new functional pathways is involved, not only in training of motor skills but in the similar process of learning in general and in conditioned reflexes.

Successful repetition of a pattern of motion renders its subsequent performance progressively less difficult and requires less concentration until the pattern becomes automatic and habitual and can be carried out with great ease. As the resistance in the specific synapses decreases, the tendency for overflow to excite muscles not essential to the smooth performance of the motor pattern also decreases, and the motion becomes progressively more sharply defined and better coordinated. Strongly developed habit patterns can only be changed by great conscious effort and persistence in retraining. However, it has been possible with intensive treatment to develop new habit patterns, for example in walking, which superseded very strongly developed habit patterns of thirty or forty years' duration. Once a habit pattern has been strongly developed and is used a

good deal, it becomes a permanent part of the individual. Similarly, once compensatory pathways are developed sufficiently to restore motor function in patients with paralysis and the substitute pathways are used in daily activity, the recovery of function becomes permanent.

4. *Fatigue.* Another factor which encourages abnormal habit patterns is fatigue. A fairly normal pattern of use of the muscles in the lower extremities in walking may be present for the first few steps. As the patient continues, fatigue sets in and he finds it more difficult to include the weaker muscles are excluded from the pattern and substitution is established. If the patient is allowed to continue to walk as far as he can without reference to the detailed gait pattern, he soon develops abnormal habit patterns of substitution of stronger muscles and exclusion of weaker ones. The abnormal patterns set up a cycle of disuse, with progressive loss of power and endurance and atrophy of the excluded weaker muscles. In this way, for example, in a patient with returning function in the anterior tibial muscle, uncontrolled attempts at ambulation associated with fatigue can set up an abnormal habit pattern excluding the anterior tibial muscle and this muscle may actually decline in function from inactivity.

This phenomenon may be the basis of the widely held view that fatigue is extremely harmful to paralyzed muscles in poliomyelitis. It must be pointed out, however, that it is the abnormal motor habit pattern, with exclusion of the weaker muscles and consequent disuse, that is responsible for the decline in function and not directly the fatigue itself. Fatigue in the weaker muscles encourages development of the abnormal pattern. But the actual basis of decline of function of the muscles is inactivity from exclusion from the habitual pattern rather than overactivity and fatigue. Careful observation in a large series of cases has failed to bring out any ill effects of fatigue of individual motions in treatment. On the contrary, the effect of fatigue of individual motions has been definitely beneficial, resulting in increased power, range of motion and endurance.

The exact mechanism of neuromuscular fatigue is not understood. It is known, however, that in voluntary motion, fatigue occurs first and to the greatest extent at synapses in the central nervous system. Fatigue also occurs at the myoneural junction and the last and least affected by fatigue is the muscle itself. The process is rapidly reversible and a brief rest restores function to the original level. In poliomyelitis, during the acute stage of developing paralysis, neuromuscular activity and fatigue may be harmful to virus infected neurons. After the acute stage is over and the virus infection has subsided, there is no possibility of further damage to neurons by fatigue since the axon and presumably the nerve cell body are relatively insensitive to fatigue compared to the synapses. Furthermore, extensive experience with a large number of cases has demonstrated conclusively in a practical way, that fatigue of individual motions in treatment is beneficial and there has been no evidence in any case that fatigue of individual motions has proved detrimental even a few weeks after the onset of poliomyelitis. Demonstration of the fact that fatigue of paralyzed muscles is not harmful but highly beneficial is important in allowing more intensive treatment with acceleration of recovery of motor function.

5. *Dormant motor neurons.* With new techniques of neuromuscular re-education which excite the motor centers very strongly, it has been possible to demonstrate dormant anterior horn cells in almost every case of poliomyelitis studied, including chronic as well as acute and subacute cases. The demonstration of dormant motor neurons is particularly striking in so-called zero muscles. In these muscles, no contraction at all occurred on attempted voluntary motion. Not only did these muscles contract unmistakably but also produced voluntary motion when the motor centers were strongly stimulated by summation of methods of facilitation such as mass movement patterns, proprioceptive stimulation and rhythmic stabilization. (These techniques will be discussed in detail later in this paper.) The fact that a significant voluntary contraction occurred in these zero muscles indicated that the anterior horn cells were not all completely destroyed but that some of the motor neurons were alive and potentially capable of function but could not be excited by ordinary stimulation. Even after the lapse of years, these cells may still be dormant, since the greatest effort to contract these muscles voluntarily failed to elicit any response. Only by means of strong stimulation of the motor centers through new techniques of neuromuscular reeducation can these dormant motor neurons be excited to discharge and produce contraction of the muscle fibers they innervate. Treatment over a period of time restored function in the dormant cells so that voluntary motion can later be initiated without facilitation.

The fact that dormant anterior horn cells can be demonstrated routinely in cases of poliomyelitis indicates that treatment is necessary to insure that all the motor neurons which have survived the virus at-

tack should be capable of full function in voluntary motion. Only then can the full potentialities for recovery of motor function be achieved. Those anterior horn cells which were affected by the virus but not killed may require stronger stimulation at the synapses to produce excitation and discharge of impulses down to the muscle fibers. More significant is the fact that the internuncial neurons in the spinal cord are usually attacked severely by the virus. Impulses for voluntary motion normally do not pass directly from the corticospinal tract to the motor neuron, but must always traverse one or more internuncial neurons before reaching the anterior horn cells. Wrecking of the internuncial switchboard by the virus can thereby prevent excitation for voluntary motion from reaching some of the surviving anterior horn cells, rendering these neurons dormant.[3] Because of the multiplicity of interconnections of the internuncial neurons, very strong excitation can reach the dormant motor neurons by a roundabout devious route and have sufficient energy to discharge these motor neurons. After the same devious internuncial pathway has been traversed a number of times, synaptic resistance decreases and then voluntary effort without facilitation or special technique is capable of exciting the dormant neurons. Once these dormant motor neurons are available for excitation through voluntary effort, their associated muscle fibers can be developed to hypertrophy.

6. *Muscle spasm.* Muscle spasm, with its associated tenderness and pain, constitutes a deterrent and disturbing influence on recovery of voluntary motion in poliomyelitis. The muscle shortening leads to contracture, limitation of joint motion and deformity. The muscle spasm and pain limit the range of motion of the antagonist muscles; but spasm also sets up proprioceptive reflexes which inhibit the voluntary contraction of the antagonist.

It is important therefore to eliminate muscle spasm and insure full range of passive and active motion and to develop voluntary power, range of motion and endurance unhampered by muscle spasm and pain. Muscle spasm is treated in a variety of ways: by application of heat in various forms, use of drugs such as curare, neostigmine, myanesin, priscol, and the like, and by stretching. It must be pointed out that intensive treatment for recovery from paralysis in a very effective method for relaxation of muscle spasm and relief from the associated pain. The latter method has the advantage of combating muscle spasm and paralysis simultaneously.

It is also evident, of course, that proper positioning of the patient and extremities is required in cases with severe and extensive paralysis in order to prevent development of contractures.

PRINCIPLES OF THERAPY OF PARALYSIS DUE TO POLIOMYELITIS

Without a basic understanding of the physiology of the neuromuscular system, one cannot be in a position to evaluate the effectiveness of different types of treatment for achieving maximum recovery of motor function. Of the greatest importance in this connection is the concept of the "motor unit." It is generally recognized that muscles do not normally contract by themselves but are invariably excited through their nerve supply. The unit in neuromuscular function is not the single muscle fiber but is the motor unit which consists of the motor neuron with its axon branching and terminating in myoneural junctions and transmitting excitation to over one hundred muscle fibers. The most fundamental characteristic of the functioning of the motor unit is that it acts on the "all-or-none" principle. This means that the motor unit, if excited, invariably brings about maximal contraction of all of its muscle fibers; in other words, if the anterior horn cell is sufficiently excited to discharge impulses, it can only produce maximal contraction of the muscle fibers it innervates. Excitation, then, is either sufficient to stimulate the anterior horn cell and produce the greatest possible activation of the motor unit or it fails to excite the motor unit at all. It must be emphasized that the muscle fibers do not have a determining influence in this process; in other words, once the excitation of the anterior horn cell is sufficient to produce the discharge of a nerve impulse, the associated muscle fibers have no choice but to contract maximally.

There are only two variable factors in the function of the motor unit:

(1) Frequency of discharge. A low frequency of discharge produces a simple twitch contraction or an incomplete or partial tetanus, while a higher frequency of discharge produces a complete tetanic contraction of the muscle fibers. Actual power of contraction of the motor unit is somewhat greater at a high frequency than at a low frequency.

(2) Condition of the various parts of the motor unit at the moment of excitation. Particularly significant in this connection is fatigue.

The quantity of activity in a whole muscle depends primarily upon the percentage of motor units being excited. When a weak contraction occurs in the muscle, only a small percentage of the motor units are active. As the strength of contraction of the muscle increases, more anterior horn cells are being stimulated and a greater percentage of the

(Continued on Page 18)

A SURVEY OF THE RESULTS IN REHABILITATION OF HEMIPLEGIC CASES

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Chief of Corrective Therapy

The following report was submitted on the results of treatment and rehabilitation of the Hemiplegic Patient, including the Corrective Therapy Section of the Physical Medicine Rehabilitation Service, at the Veterans Administration Hospital in Louisville, Kentucky. This report emphasizes the saving that results and the expense that is spared the Veterans Administration and the veterans' families by such treatment.

These figures show that the return, to a normal, a useful independent, or a partially independent life, was hastened or made more probable. In many cases, the need for costly family or attendant care upon return to the home was avoided. In many cases, the patient was able to help better the family conditions or did not become a burden to them. In many cases, domiciliary or continued hospital and nursing care was avoided.

This survey covers a study of the cases of one hundred and sixty-five (165) hemiplegic patients, receiving treatment from September 1947 through the third week on September 1950.

Eighteen (18) were post traumatic cases; one hundred and forty-seven (147) were the results of cerebral vascular accidents.

Seventy (70) were paralyzed on the left side; ninety-three (93) on the right side; four (4) had suffered cerebral vascular accidents to both hemispheres.

Eighteen (18) were over the age of sixty-five; one hundred and twenty-two (122) were between the ages of sixty-five and fifty; twenty-five (25) were below the age of fifty.

The average treatment period was six (6) weeks, with a range of treatment from one week to two years. Five (5) patients received treatment on an out-patient basis and three (3) still receive treatment on this out-patient basis.

Thirty-eight (38) were ambulating when first contacts were made by therapists. Through treatment, all of these patients became more proficient in ambulation and in the use of the involved extremities. Eighty-four (84) began treatment as wheelchair patients and forty-six (46) began treatment as bed patients. Forty-five (45) patients had to be treated with special precautions because of an attendant cardiac condition. Thirty-five (35) were aphasic, either partial or complete. Twenty-one (21) were extremely confused or incompetent.

One hundred and thirty-five (135) of the one hundred and sixty-five (165) were discharged to return home. Nine (9) others expired because of other complications. Five (5) were sent to a domiciliary home and two (2) were transferred to the Fort Thomas Veterans Administration Hospital for further rehabilitation.

Twelve (12) still remain in the hospital and of these two (2) are recent accidents. Of those remaining, seven (7) are now amblatory and to be discharged in the near future; three (3) are wheelchair patients and two (2) are receiving treatment in bed.

Nineteen (19) patients were returned to the hospital for additional treatment; seventeen (17) were discharged again after having received treatment and having returned to a nearly normal state; two (2) expired. Ten (10) other patients were returned to the hospital because their families could not care for them properly; one (1) of these expired; two (2) remain as wheelchair patients with a very poor prognosis; the other seven have been discharged home again. Seven (7) of the twenty-nine (29) patients returning to the hospital have suffered more than one cerebral accident and two (2) of these seven (7) have suffered as many as six cerebral accidents.

Upon discharge, seventy-one (71) were walking unassisted, or quite extensively with the aid of a cane. Thirty-eight (38) were walking with a cane, or cane and brace, within their wards and within the clinics. Seventeen (17) were walking between parallel bars or walkers with close supervision and assistance. Nine (9) were still bed patients.

Upon returning home, twelve (12) were able to work full time and at regular jobs. Twenty-three (23) were able to return to milder or part time work. Fifty-four (54) could do odd jobs for others or work about the homes and were almost independent of any care. Twenty-one (21) were ambulatory but were dependent on others for supplying daily needs and care, to a great degree. Seventeen (17) were limited to the use of a wheelchair but twelve

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(12) of these could perform most self care; the other five (5) required almost total care. Eight (8) others were bed patients; five (5) of whom could perform some self care but three (3) were totally dependent on others.

Nineteen (19) regained normal use, or nearly so, of the involved upper extremities. Twenty-six (26) regained use with some restriction or diminished strength of the part. Thirty-one (31) regained some slight use. Fifty-nine (59) regained no use for finer or voluntary movements.

Corrective Therapy coordinated treatment with other sections of the Physical Medicine Rehabilitation Service in setting up and helping to attain goals in the rehabilitation of these hemiplegic patients. Active exercises and physical activities have contributed toward increases in organic and systemic efficiency and in development of neuromuscular patterns. They have resulted in improvement of muscle tone and function and increases in strength and endurance of involved and unaffected parts. Contractures are often relieved or prevented through use of muscle stretching exercises.* Physical activities accentuate the self care activities program and help to develop self confidence and independence. They result in acceleration of progress in ambulation and reeducation of walk. A better understanding of personal needs and necessity for social adjustment are obtained by the patient. Better adaption to and manipulation of crutches, canes, braces, or wheelchairs results.

When the patient has progressed until treatment in bed is no longer necessary, he is then brought to the clinic each day in a wheelchair to receive his treatment. At the clinic, progressive general exercises and progressive ambulation are slowly increased or reeducation of walk emphasized and patients are encouraged to walk to the clinic for treatment as soon as possible. The use of equipment and apparatus available in the clinic permits more strenuous measures of treatment to be continued and shortens the length of time necessary to meet the increased tolerance of the patient. Exercise machines, parallel bars, walkers, crutch-cane aids, steps, mirrors, and other specially designed devices are of great assistance in the treatment of the patient at this stage.

In the Corrective Therapy Section, as in all other sections of the physical Medicine Rehabilitation Service, the patient receives psychological encouragement to develop the proper attitude toward his condition and is taught to help himself. He is also taught to evaluate his ability to perform various types of activities and to accept his limitations in the performance of others. This ability to evaluate is directed toward helping him to attain maximum use of his remaining faculties. The patient is thus enabled to return to a more cheerful, independent, and useful home life upon discharge from the hospital. It is felt that the patients benefit greatly, both physically and mentally, from such treatment.

* Muscle stretching exercises referred to are of the active type as in use of the heel cord stretcher or movements of the parts actively or assistively through a full range of motion.

DISPOSITION CHART

Disposition	Discharged Home	To Domiciliary	To Rehabilitation Hospital	Remaining In Hospitals	Expired	Total
Rehabilitated from ambulation to better ambulation	35	3	2	1	1	42
Wheelchair to Ambulation	52	2	0	2	1	57
Bed to Ambulation	21	0	0	4	2	27
Bed to Wheelchair	18	0	0	3	3	24
Bed Patients Only	9	0	0	2	4	15
TOTALS	136	5	2	12	11	165

USE OF ARM AND HAND

Normal Use	19	2	0	2	2	25
Some Restriction	26	1	0	3	2	32
Slight Use	31	1	1	3	2	38
No Use	59	1	1	4	5	70
TOTALS	135	5	2	12	11	165

THE REHABILITATION OF THE HEMIPLEGIC PATIENT

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The hemiplegic patient, who has had a cerebral accident, as a result of embolism or thrombosis, can usually begin rehabilitation activities a few days after the accident. If the hamiplegia is caused by a hemorrhage, rehabilitation procedures should be limited to bed activities for three weeks.

The PURPOSE of a program of rehabilitation is to re-train the patient to walk and travel; to care for his daily needs and to obtain the maximum use of the affected and unaffected arm, hand and speech.

The CAUSE of the hemiplegia should be known before starting rehabilitation procedures as the program involves strain and stress on the cardiovascular system. The three principal causes of cerebral accidents are congenital lesions, trauma and disease.

The CONGENITAL causes may be the result of absence or malformation of the cranial contents, anoxia and injury to the brain by the normal mechanism of labor or forceps.

TRAUMATIC hemiplegia may be caused by fractures, sheer force, bullets or the results of surgical procedures.

DISEASE may produce the paralysis by alternation of the architecture of the blood vessels through the pathological media of spasm, thrombosis, emboli, or hemorrhage. These changes usually result from cardiovascular disease.

DISABILITIES which result from a cerebral accident are limitation of motion of the joints on the affected side and a spastic or flaccid paralysis. There may be a facial paralysis and if the paralysis occurs in the dominant arm the patient will usually have a sesory and motor aphasia.

EVALUATION OF THE DISABILITIES. If treatment is started early there will be no limitation of motion at the joints and the affected arm and leg can be passively moved through their normal range. If, however, the patient is not given early rehabilitation, contractures usually result, especially at the shoulder.

A flaccid hemiplegia only occurs in a small percentage of patients. The usual spastic hemiplegic presents the following signs:

The affected *arm* is internally rotated and adducted and the forearm, wrist and fingers are flexed. When the patient is asked to move his affected arm, he will elevate the shoulder and abduct and internally rotate the arm. When the patient's *leg* is fully extended voluntary dorsal flexion of the foot is impossible. When, however, the knee is flexed and the patient flexes his hip against resistance, the foot will dorsiflex and supinate. (Strumpell's phenomena)

Some individuals may have an angiospasm of the cerebral vessels and present a typical hemiplegic syndrome. There is usually a complete return of function in a few days. If a patient has a normal return of function in the upper extremity the lower extremity will usually be found to be normal.

The *speech* disability should be evaluated by a speech pathologist.

TREATMENT. The purpose of a program of rehabilitation for the hemiplegic patient is (1), to prevent deformities; (2), to treat deformities if they occur; (3), to re-train the patient in ambulation and elevation activities; (4), to teach the patient to perform the activities of daily living and working with the unaffected arm and hand; (5), to re-train the affected arm and hand to its maximum capacity and (6), to treat the facial paralysis and speech disability if they are present. The rationale of treatment is based on man's development of movement through the ages.

1. PREVENTION OF DEFORMITIES. The spastic hemiplegic patient, when lying in bed, holds the upper extremity in adduction and internal rotation with the elbow, wrist and fingers of the affected part in a flexed position. The affected lower extremity is usually flexed and adducted at the hip joint, the knee is flexed and the ankle is plantar flexed and supinated.

If treatment is started within a few days following the cerebral accident, there is no need for any special procedures to protect the affected limbs. If, however, due to hemorrhage in the brain or other complications, the patient must remain in bed for a period of time, then procedures must be instituted to prevent deformities.

PROCEDURES. A posterior ankle splint is needed to prevent shortening of the heel cord. A pillow in the axilla will prevent adduction and internal rotation of the shoulder joint which is a frequent residual deformity in hemiplegia.

Passive movements of the arm in abduction, external rotation and in the overhead position, should be performed several times a day to prevent a "frozen shoulder."

2. TREATMENT OF DEFORMITIES. The principal deformities which occur are a "frozen shoulder" and short heel cord.

PROCEDURES. The use of heat and message to the arm and shoulder are of value in preparing the part for stretching. Passive movements of the shoulder are of value in preparing the part for stretching. Passive movements of the shoulder are useful in increasing the range of motion. These movements can be performed by a therapist, nurse, or by the patient. (See Exercises I & II.)

A short heel cord seldom requires operative procedures. The heel cord can usually be lengthened with stretching and a short leg brace with a 90 degree to 110 degree stop at the ankle to hold the gains made by stretching and ambulation.

3. AMBULATION. Flexion and extension movements at the hip and knee can usually be performed by the spastic hemiplegic patient who is started on early ambulation. When, however, the hip and knee are flexed, as in walking, the foot dorsiflexes and supinates. The patient is usually afraid to place the supinated foot on the floor because of the danger of injuring the ankle or falling. To prevent this foot movement he walks with the hip and knee joint stiff and circumducts the lower extremity. This is a slow, awkard gait and if used for a period of time the patient will develop a pattern of walking which will be difficult to correct. A double bar short leg brace with a stirrup attachment, 90 degree ankle stop and a supinator "T" strap should be prescribed to prevent plantar flexion and inversion of the foot and give the patient confidence, so that he will flex his knee and hip. With the brace, and a cane in the unaffected hand for balance, most hemiplegic patients soon learn to walk without assistance.

A patient with a flaccid hemiplegia from a cerebral accident will be unable to make a voluntary movement when in the supine position. If, however, the patient is held in the erect position with the affected lower extremity on the floor, he will flex and extend the leg as in walking and be able to bear his body weight. The sensory contact of the foot on the floor stimulates the reflex pattern of walking. Ambulation should be the first procedure in the rehabilitation program as it can be accomplished by the majority of patients.

Many patients, especially those in the younger age groups, learn to walk with a good reciprocal pattern without the aid of a cane. No patient, however, seems to learn the reciprocal arm pattern without special training.

The normal pattern of walking is to move the right arm and left leg forward and then the left arm and right leg. The hemiplegic patient walks with the affected arm motionless, abducted and partially flexed at the elbow. It is necessary to break this pattern of walking if the patient is to have the appearance of being normal.

The following methods are suggested for retraining in the normal pattern of walking:

Method No. I. Retraining in walking.

Equipment: Parallel bars with a sliding part over the bars.

Round card board boxes with the ends removed can be opened on one side and placed over the bars. The open sides can be taped together with adhesive tape to hold them on the bars.

Position: Stand between the bars with one hand on each bar. The affected hand is placed on the movable box and may be tied if necessary.

Instructions: Step forward with the right foot and move left hand forward along the bar. Step forward with the left foot and move the right hand along the bar.

Repeat 5 times, several times a day.

Method No. II. Retraining in walking.

Equipment:None.

Position: Standing with feet together and arms at the side.

Instructions: Step forward with the right foot and swing the left arm forward and point to the right foot. Step forward with the left foot and swing the right arm forward and point to the left foot. The opposite arm and leg must be moved together and remain parallel at all times.

Repeat 5 times, several times a day.

With children a red ribbon is tied to the right wrist and left foot and a yellow ribbon to the left wrist and right foot. The children are instructed to move the red ribbons forward and then the yellow ribbons.

When the patient can walk with the reciprocal pattern of arm and leg movements and talk with the instructor the pattern is formed and the patient is retrained in walking.

4. THE UPPER EXTREMITIES. As a return of function in the affected upper extremity cannot be expected for a long period of time, if it ever does return, it is essential to teach the patient to care for his daily needs with his *unaffected arm*. "A lobster can grow a claw, a man cannot, but he has what the lobster does not have, a brain to meet the needs of the situation."

A right hemiplegia in a right-handed person is a serious disability because of the usual sensory and motor aphasia and the lack of skill in the left hand to perform the activities essential for daily living. The training of the left hand should be started early as the patient must become left-handed if he ever hopes to care for his daily needs. Simple tasks in eating and dressing should be started. Left hand writing must be practiced as this is an important means of communication, especially when speech is affected.

Training of the *affected* arm is started while the patient is developing one-handed skills with the unaffected arm. If the arm is flaccid, a reeducation program similar to that used in poliomyelitis should be started. Many of these patients have a complete return of function if muscle reeducation is carefully given over a long period of time. The rehabilitation of the spastic arm should start at the shoulder. The most difficult shoulder movement for the patient to regain is external rotation. Flexion and extension of the forearm is difficult for the spastic hemiplegic to perform. When asked to flex the elbow, he elevates the shoulder and abducts and internally rotates the arm. Pronation and supination of the hand are usually impossible, as these are the last movements learned by man and the last to return. Internal and external rotation of the arm are primitive movements and the patient attempts to substitute these movements for pronation and supination. The fingers and thumb are usually flexed tightly. If the fingers and thumb are forced open they can be flexed, but active extension movements are usually impossible; on yawning, the fingers of the hand usually extend. THE EXERCISE PROGRAM for retraining the affected arm depends upon the patient. Results cannot be expected by having a therapist work *on* the patient. Working *with* the patient so that he understands what exercises are to be practiced many times a day is the only procedure which will improve the disabled arm.

Exercise I. Flexion of the arm at shoulder.

Purpose: To maintain, or increase, the shoulder movements and to strengthen the shoulder girdle muscles.

Position: Sitting on a chair or lying supine in bed.

Instructions: The patient grasps the wrist of the affected arm with the fingers of the unaffected arm. He raises the arms forward upward as far overhead as possible. *Repeat 5 times, on the hour.*

Exercise II. Flexion of the arm at shoulder.

Purpose: As in Exercise I.

Position: Sitting in a chair directly under pulley. Affected hand grasps or is tied to one end of pulley rope. Unaffected hand grasps the other end of rope in overhead position.

Equipment: Rope, handles and a pulley.

Instructions: Extend normal arm, thereby causing flexion at the shoulder joint of affected arm. *Repeat 5 times a day.*

Exercise III. Flexion and Extension of the forearm.

Purpose: To obtain full range of motion at the elbow and active flexion and extension of the elbow without abduction.

Position: Sitting in a chair, elbows close to side of body and palms of the hands together with the ulna side of the hands resting on the affected knee.

Instructions: He flexes the forearms and touches the chin. *Repeat 5 times on the hour.*

The patient may have difficulty in opening the spastic fingers with the unaffected fingers, but the best possible position should be obtained.

It is an interesting neuromuscular phenomenon that when the hands are clasped, or even brought in contact, the elbow can be flexed without any abduction of the shoulder. When the hands are separated and the patient is asked to flex the elbow, the affected arm will abduct and rotate inward.

Exercise IV. Flexion and extension of the forearm and supination and pronation of the hand.

Purpose: To combine flexion and extension of the elbow with supination and pronation of the hand.

Position: As in Exercise III.

Instructions: The patient places his palms together as in Exercise III, flexes the forearm and supinates the affected hand as he raises it to the chin. On extension of the forearm the hand is pronated. *Repeat 5 times on the hour.*

The tight supinator muscles of the affected arm can be stretched by the unaffected hand. Flexion of the elbow with supination of the hand are the most useful movements in performing the activities essential for daily living.

Exercise V. Flexion of forearm and arm of the affected side.

Purpose: To combine these flexion movements so that the patient may use the hand in daily activities, such as holding paper down while writing.

Position: Sitting in a chair in front of a table.

Instructions: The patient flexes the forearm to table level and then flexes the arm so that the forearm rests on the table. These movements must be performed without elevating the shoulder or abducting the arm. *Repeat 5 times on the hour.*

The habit of keeping the hand in the lap is not conducive for re-education.

It must be placed in the position for finger action.

The WRIST. If it is not flexed, needs no special training. There are very few activities we cannot perform even with a fused wrist. We have increased the functional use of the hand in several patients with extreme flexion of the wrist by fusing the wrist joint. A cock-up splint should be used if there is extreme palmar flexion of wrist and this should be combined with a "pan-cake" splint if the fingers are tightly flexed.

The FINGERS of the spastic hemiplegic patient are practically impossible to reeducate for any useful purpose. If adequate function is attained, it will take years of effort by the patient. In the aged, with cardiovascular disease, it is not often worth the effort. We should not, however, have the patient give up hope of ever using the fingers. He must be made to understand that movements of the fingers depend upon the proper functioning of the shoulder, elbow and hand and upon placing the hand in positions for purposeful movements. The following exercises for the fingers can be used for the purposes indicated.

Exercise VI. Extension of fingers and thumb.

Purpose: To prevent finger contractures by extension of fingers and thumb.

Pohition: Sitting on a chair.

Instructions: With the fingers of the unaffected hand, extend each finger and the thumb of the affected hand. *Repeat 5 times on hour.*

Exercise VII. Extension of fingers and thumb.

Purpose: As in Exercise VI.

Position: Sitting in a chair with hand resting on table in pronation and fingers extended as far as possible.

Instructions: Press backward and downward on the dorsal surface of the hand so that the palm of the hand is in contact with the table. *Repeat 5 times on the hour.*

Exercise VIII. Extension and flexion of fingers and thumb.

Purpose: To produce passive movements of extensors and active movements of flexors.

Position: As in Exercise VII with a pencil resting on the table under the palm of the hand.

Instructions: Press backward and downward on the dorsal surface of the hand so that palm of hand is in contact with the table. Release pressure, flex the fingers and pick up the pencil. *Repeat 5 times on the hour.*

SPEECH: When the hemiplegia affects the dominant hand the patient will usually have a sensory and motor aphasia.

There is nothing so frustrating as being unable to express one's self. The type and extent of the speech disability should be evaluated and the proper treatment instituted by a speech pathologist.

DEVICES: The objectives of a rehabilitation program are to teach the patient to perform the activities of daily living. Complete independence may be impossible without the aid of special equipment. It is difficult to cut meat with one hand. The hemiplegic and arm amputee find the combination knife and fork a useful gadget in performing this activity. A special hand brush with two suction cups makes it possible to affix the brush on the mirror or wall for one-hand cleaning. There is a special wheelchair which makes it possible for the hemiplegia patient to roll the chair with one hand.

CONCLUSIONS: The rehabilitation of the hemiplegic patient should be started as soon as definitive care is no longer required. The objectives of the program are: to begin ambulation, with the aid of a short-leg brace if necessary; to teach the patient to perform self-care activities with the unaffected arm; to treat the affected arm in order to reeducate the muscles and prevent deformities and to give speech therapy if aphasia is present.

ATTENTION MEMBERS

The 1951 renewals are due. Be prompt with your checks. The Journal will be mailed only to members of good standing. Please check your mailing address with the Secretary to insure receipt of the Journal.

The following questionnaire has been distributed to all active members as of October 1950. The returns have been excellent thus far. However, it is felt that through faulty mail service, change of addresses, and new memberships, etc., a number of active members have not been contacted.

If you are an **active** member and have not received this questionnaire, please fill it out and return to the editor. The information will be kept confidential. Thank you.

SURVEY OF BACKGROUND OF CORRECTIVE THERAPY PERSONNEL

Name.....

Address.....

Veteran..... Non-Veteran.....

Title at Present Position..... Location.....

EDUCATIONAL BACKGROUND

High School	Completed	Years Completed

College—Name	Years Completed	Major Field	Degree

Graduate School	Years Completed	Major Field	Degree

Special School	Years Completed	Field of Specialty

HOSPITAL EXPERIENCE

List Place	Years	Type (Hospital, etc.)

PROFESSIONAL AND RELATED EXPERIENCE

Title	Years	Type (Hospital, School, etc.)

PUBLICATIONS OR SPECIAL AWARDS

Signature (Optional)

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EDITORIAL

Facing A New Challenge

Our Association faces a new and encouraging challenge, in House Bill No. 4051. This bill is an Act, which calls for the establishment of rehabilitation centers in every State of the Union, where a need exists.

The stated purpose of the Act, is—"To encourage and assist physically and mentally handicapped persons, to help themselves prepare for and engage in, remunerative employment to the extent of their capabilities, thereby increasing not only their social and economic well-being, but also the productive capacity of the Nation."

Under Title IV of the Act, the term Rehabilitation Center, is defined as—"a facility operated for the primary purpose of assisting in the rehabilitation of disabled persons who are eligible," and provides, "one or more of the following services—

1—testing, fitting or training in the use of prosthetic devices;

2—prevocational or *conditioning therapy;*

3—physical therapy, *corrective therapy,* or occupational therapy;

4—adjustment training or

5—evaluation or control of special disabilities."

Corrective Therapists should note, that these Rehabilitation Centers—to be known as "Public Rehabilitation Centers and Other Non-profit Centers"—are to be staffed by Corrective Therapists as well as Physical Therapists and Occupational Therapists.

Space does not permit a digest of the Act. Secure a copy. Explain its provisions; propound its advantages to any community, large or small, where the need exists.

Many Rehabilitation Centers are needed. It has been estimated, that there are 80,000 civilian paraplegics in America today. In October of 1949 there were 500 paraplegics on the rolls of the United Mine Workers Welfare Agency. Two hundred and fifty of these men were under treatment. This is but one of the many agencies concerned with rehabilitation.

Challenges create opportunities. As the Holiday Season approaches with its message of "Peace on Earth, Good Will Toward Men," it would be fitting to ask ourselves a few pertinent questions.

1--Are we taking full advantage of every opportunity to grow professionally?

2.—Are those of us near the Schools of Physical Education now giving or developing courses in Rehabilitation, taking advantage of these opportunities?

3—Are those lacking some of the undergraduate courses, needed as entrance requirements, matriculating in a nearby College or University?

4—Do we fully appreciate the plight of the average citizen when disaster overtakes, and appreciate the problem his rehabilitation presents, in contrast to the Veteran, who has been so adequately provided for in the Physical Medicine Rehabilitation Service, with its five coordinated divisions in the Veterans Administration Hospitals?

5—Are we familiar with what is being done, upon the Physiatrists prescription in Physical Therapy; Occupational Therapy; Manual Arts Therapy and Educational Therapy?

6—Are we giving exercises as prescribed by the Physiatrist or Physician in charge?

7—Do our Progress Notes tell clearly what we are doing and how the patient is responding to the prescribed treatment, so that the Physiatrist may have the information needed to change the prescription when he finds it necessary?

8—Are we initiating any research problems?

9—Have we acquainted ourselves with the many research problems indicated in Dr. C. H. McCloy's stimulating article, which appeared in the August-September issue of the Journal this year?

10—Are we making the necessary personal contacts in our local situation to be in position to initiate some of this needed research?

"BY THEIR WORKS, YE SHALL KNOW THEM," should be an ever present reminder to be satisfied with nothing but our best, without reservation.

—E. M. S.

We Introduce—Our Secretary

Mr. Louis Frazier

Mr. Louis M. Frazier is a charter member of our Association. He entered the field of physical and mental rehabilitation in August 1946 as a Corrective Therapist. In 1947 he was made the Acting Chief and in 1947 he became the Chief of the Corrective Therapy Section at the Kennedy Veterans Hospital. In this capacity he has done an outstanding job in organizing the program at Independence Hall.

Mr. Frazier received his professional training at the Arkansas State College where he received a Bachelor of Science Degree with a Major in Physical Education and Social studies.

During the war years Lou served three years in the Marine Corps, the last year, in the Pacific Theater. At present he is a First Lieutenant in the Fourth Assault Signal Battalion of the Marine Corps Reserve.

Mr. Frazier is mild mannered, soft spoken, determined and sincere. He served as the registration chairman at the Association Convention held in Memphis, Tennessee. We all remember how diligently he worked and how he has helped to make that convention a success. We welcome him as an officer of our Association and we know that he will serve us faithfully and well.

The President Speaks

A topic that is always timely is one that deals with the ethics of a profession, particularly those of our own designed for functional purposes. These rules and guide lines, self-imposed, must be reviewed consistently to better ourselves and our Association. Too often, we are prone to accept the path of least resistance when a strict "Code of Ethics" is required.

As a point of information, Mr. Webster defines Code of Ethics as "any system of principles or rules." We must be concerned with a very definite set of principles that will place us in a categorical position with other professions within the medical circle.

There is no need to go into detail on the subject when a few hard and fast rules will help keep our members on a high ethical plane. It is the duty of the Association to take steps to see that certain standards are maintained. For example, if a member is known to be treating without medical prescription, it will be necessary for the Association to seek out such a person and penalize this member in proportion to his misdemeanor. This is the only method by which the Association will be able to protect its membership who are attempting to maintain the highest professional standards.

The Professional Standards Committee has made recommendations to your President that will be put into practice by a majority vote of your Representative Assembly. These recommendations are directed toward raising Educational Standards and improving our Code of Ethics.

Our ethics are comparable to the rules of any game. It is important to play hard but within the bounds of good sportsmanship. We are often reminded of the coach who would say, "It matters little whether we win or lose, but how we play the game." It is natural to want to win but what is actually more important is the method that is employed in winning. The team is judged by the conduct of its players. The Association is judged by the action of its members. One foul can nullify the progress made by the entire profession.

BASIC EXERCISES IN THE TREATMENT OF MULTIPLE SCLEROSIS AND SIMILAR DISEASES OF NEUROMUSCULAR DYSFUNCTION

By Stanley H. Wertz, Corrective Therapist
VAMTG, Kennedy Hospital, Memphis, Tenn.

In the October-November issue of the Journal therapeutic exercises and rehabilitation were discussed at length as a modality of treatment for multiple sclerosis. The following conclusions were drawn:

1. Because of the varied disabilities of the disease the treatment is complex and no two cases can be dealt with exactly alike.
2. Chronic fatigue is a factor to be considered in most cases.
3. Cerebellar type patients must receive special training in coordination exercises for the control of tremor.
4. The types that resemble hemiplegia and spastic paraplegia without cerebellar involvement should receive heavy resistance exercises working up to reciprocal patterns of movement.
5. Before discharge from the clinic or rehabilitation center the patient must be trained for a home exercise program to combat the progressive nature of this disease.

The pulley weights, used with the patient in various positions on a treatment table have been found especially effective. The equipment needed consists of a set of pulleys with two upper and two lower attachments and two handles. Leather ankle straps with a ring for attaching the pulley weights can be made at the orthopedic brace shop. If the hand and fingers are too weak to hold the handles, a similar set of straps can be made for the wrists.

The exercises illustrated in this article have also been used successfully in the treatment of Parkinson's disease, hemiplegia, residual poliomyelitis, some types of cerebral palsy and spastic paralysis. Mass or so-called primitive movements should be introduced early in treatment to stimulate the proprioceptor reflexes. An example would be a combination of hip flexion, adduction, and external rotation with the knee flexed or extended.

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*(This paper was presented at the Fourth Scientific and Clinical Session of The Association for Physical and Mental Rehabilitation in May 1950 at Memphis, Tennessee)

Fig. 1. Shoulder extension. Draw one arm at a time toward the hip and hold slowly through range. Keep forearms pronated and avoid bending of elbows. Do alternately and reciprocally.

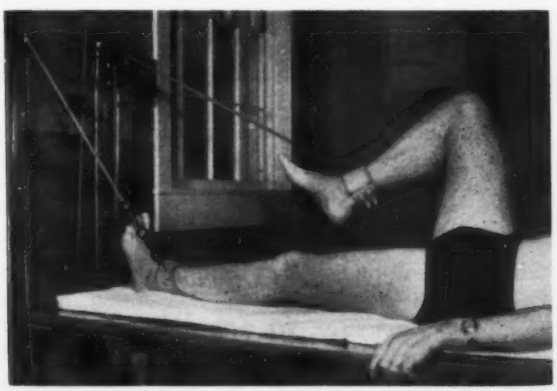

Fig. 2. Hip Flexion. Bend knee slowly and draw it back toward the chest. Hold slowly through range. Avoid outward draw of sartorius. Do alternately.

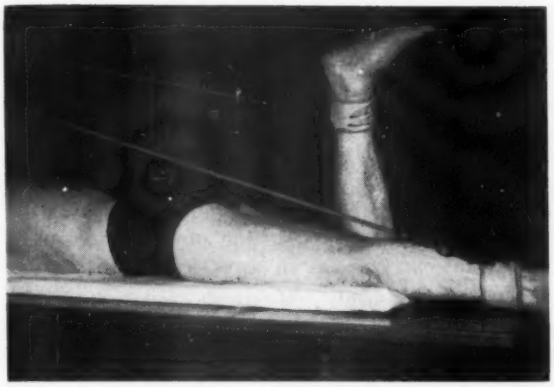

Fig. 3. Knee extension. Allow knee to bend back slowly and then straighten it to original position on table. Avoid rotation of hips. Do alternately and reciprocally.

Fig. 4. Shoulder flexion. Roise one arm at a time to a position back of the head and hold slowly through range. Keep elbows straight and arms pronated. Do alternately and reciprocally.

Fig. 5. Hip extension. Bend the knee slowly and allow it to come all of the way back. Then straighten hip and knee to original position. Do alternately and reciprocally.

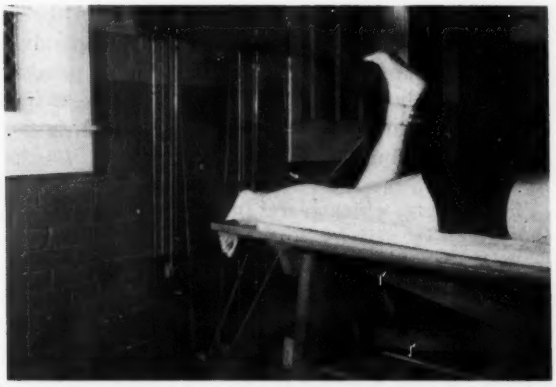

Fig. 6. Knee flexion. Bend knee slowly up to perpendicular position and then hold slowly through range. Keep hips flat on table and avoid rotation of hips. Do alternately and reciprocally.

Fig. 7. Knee extension. Attach pulleys under table. Straighten knee slowly to end of range and hold. Keep erect sitting position and avoid inversion of ankles. Do alternately and reciprocally.

Fig. 8. Hip abduction. Draw leg sideward and downward off edge of table and hold slowly through range. Keep the back flat on table and knee straight. Do individually on each side.

muscle fibers contracts. A maximal contraction involves activation of all of the motor units of the muscle. In involuntary motion, the stronger the effort and the resulting muscular contraction, the greater the proportion of active motor units in the peripheral mechanism and, presumably, the greater the proportion of active units also in the central pathway. A second less important factor in determining the strength of contraction of a muscle is variation in the frequency of nerve impulses. A stronger contraction is usually associated with somewhat higher frequency and a smoother tetanic contraction of muscle fibers.

The generally accepted plan of neuromuscular reeducation in treatment of paralysis of various types at the present time, is based on a sequence starting with passive motion; then, gradually over a period of time going through assisted motion, free motion and finally, resisted motion.[4] This system of neuromuscular reeducation apparently grew out of the impression that overactivity and fatigue of paralyzed muscles is harmful and will increase the paralysis. It has already been pointed out that this attitude is erroneous and that fatigue of individual motions is not harmful but beneficial.

This system, which places great emphasis on avoiding excessive activity and with most of the time spent in passive and assistive exercise, is relatively ineffective in the therapy of paralysis. The reason for this is obvious if one considers the physiology of the motor unit. In passive motion there is no activity of the motor units at all. In assistive motion only a tiny percentage of all of the motor units of the muscle are active in a single effort. The motor units that are active, even in assistive motion, are functioning maximally because of the "all-or-none" principle. Since it is the activity of the motor unit which can lead to such beneficial effects as muscular hypertrophy and overcoming disuse, what conceivable advantage can there be in keeping the vast majority of the motor units inactive in such a therapeutic program? A number of investigators, working empirically in comparing the effectiveness of resistive exercise employing weights with the usual passive and assistive physical therapy program, have found consistently that resistive exercise is much more effective in restoration of function in paralysis.[5 6 7 8] The reason for this difference is that even with such a simple approach as the use of weights for resistance, a much larger proportion of the motor units are excited with each voluntary effort and the total amount of activity in the motor units in a given period of therapy time is greatly increased.

Let us consider these factors individually:

1. *Hypertrophy.* It has been pointed out previously that muscle power can be significantly enhanced by hypertrophy of the remaining innervated muscle fibers. It is evident that hypertrophy will result more effectively when most of the motor units are active with each effort as compared with excitation of only a small proportion of the motor units in a single exercise (as in assistive motion).

2. *Preventing disuse.* Maximal excitation of the muscle involving all of the motor units is obviously more effective in preventing disuse. In addition to preventing disuse more effectively in the motor units, maximal excitation of voluntary motion will also be more effective in preventing disuse in the central mechanisms.

3. *Development of correct motor patterns.* Correct patterns of motion require supervised training in complex activities; however, acceleration of recovery of motor function in paralyzed motions will make it easier to incorporate these motions in a correct total pattern. This can be brought about more effectively by therapy for the individual motions based on maximal activation of the voluntary motion. In addition, it is possible by use of resistive techniques of therapy to carry out training more effectively in formation of habit patterns for complex activities, such as sitting balance of standing balance, by maximal excitation of the pattern of motion. Such resistive techniques for maximal activation of the motor pattern can also be applied in training of essential skills in occupational therapy.

4. *Fatigue.* Recovery of endurance as well as power can be accelerated by use of therapeutic techniques involving maximal excitation of the motor units in individual voluntary motions. Furthermore, with more rapid recovery of endurance, the problems created by fatigue in training of correct motor habit patterns are also decreased.

5. *Dormant motor neurons.* It has been pointed out previously that dormant motor neurons cannot be excited initially even by the maximal voluntary effort of the patient. Superstimulation of central mechanisms is essential and these methods will be discussed later.

6. *Muscle spasm.* Relaxation of muscle spasm and decrease in tenderness and pain with greater passive and active range of motion can be brought about with the aid of therapeutic techniques of active exercise. Two methods are available to produce this

relaxation: (a) Immediately after contraction of a muscle in voluntary motion, particularly maximal isometric contraction from stretch, relaxation of muscle spasm supervenes. In this technique, voluntary excitation is followed by voluntary inhibition which is capable of inhibiting the involuntary reflex muscle spasm. The greater the excitation, the greater the subsequent inhibition of the motor neuron, and resistive therapy with maximal facilitation of excitation will be much more effective than assistive motion in producing relaxation of muscle spasm. As the inhibitory pathway is developed through repeated maximal activation, voluntary relaxation gradually eliminates the muscle spasm and its sequelae. (b) Maximal voluntary contraction of the antagonist muscle, particularly in the shortened range of motion, results in reciprocal relaxation of the agonist with relaxation of muscle spasm. This pathway for reciprocal inhibition can also be developed through repeated maximal excitation and is effective in relaxation of muscle spasm, in increasing passive and active range of motion, and decreasing the associated pain and tenderness. Both direct and reciprocal inhibition are stimulated more effectively in diagonal mass movement patterns than in simple straight motions.

In treatment of poliomyelitis and peripheral nerve injuries, electrical stimulation of the muscles is used a good deal as a method of treatment. This method is particularly valuable in peripheral nerve lesions since direct stimulation of the denervated muscle can help to prevent atrophy during the period when the motor nerve fibers are regenerating. In poliomyelitis, however, electrical stimulation has only limited usefulness. While electrical stimulation of the muscle directly, and of the nerve, can produce contraction, unlike in paralysis from peripheral nerve injury there is no real value in preventing atrophy of permanently denervated muscle fibers. The therapeutic effect therefore is limited to the innervated muscle fibers in poliomyelitis. Stimulation of *all* of the remaining innervated muscle fibers by electrical stimulation from each stimulus cannot be accomplished since maximal stimulation of the nerve or muscle would be too painful. For this reason, the intensity of electrical stimulation must be decreased to a tolerable level which results in excitation of only a small proportion of the innervated muscle fibers. If, through specialized techniques of neuromuscular reeducation, voluntary motion could activate more of the muscle fibers than can electrical stimulation, the former technique would be preferred. Furthermore, it should be pointed out that electrical stimulation of the nerve produces excitation only in the nerve, myoneural junction and the muscle, whereas voluntary motion activates, in addition, the central mechanisms and the anterior horn cells, which is another advantage favoring neuromuscular reeducation. The stimulation of the central mechanism for voluntary motion is particularly important in developing pathways for excitation of severely paralyzed muscles and for starting innervation of dormant anterior horn cells. As has been pointed out, only repeated activation of the central mechanisms can decrease synaptic resistance and thereby make it easier to innervate the severely involved muscle voluntarily. With the availability of highly effective methods for facilitation of voluntary motion resulting in maximal excitation of the remaining anterior horn cells, electrical stimulation in the treatment of poliomyelitis will play a less important role.

FACTORS INFLUENCING TREATMENT OF UPPER MOTOR NEURON PARALYSIS

Up to now the discussion has been confined to recovery of function in one particular type of paralysis, namely poliomyelitis. In patients with lesions of the corticospinal tract, the peripheral motor unit mechanism is entirely intact, yet paralysis may be severe and some muscles may not respond at all to the attempt at voluntary motion. In patients with lesions of the corticospinal tract there is, to a limited extent, spontaneous recovery of function; for example, in thrombosis or hemorrhage of the internal capsule, paralysis of the opposite extremities may be complete at first but there is gradual recovery over a period of time based on recovery from shock, subsidence of edema and ischemia in adjacent areas and, particularly, compensation through the taking over of function of voluntary motion by extrapyramidal pathways. It is well established that this process of compensation occurs, since in a monkey after complete removal of the motor cortex on one side, there is a great deal of spontaneous recovery of function despite complete anatomical destruction of the affected corticospinal tract. This recovery of function has been shown to result from the taking over of the function of voluntary motion by extrapyramidal mechanisms.[1]

Essentially, upper motor neuron paralysis is related to the presence of large numbers of dormant anterior horn cells which are intact anatomically and are potentially capable of function, but which do not receive sufficient excitation from higher centers to cause them to bring about contraction of the muscle fibers they innervate. The severity of the paralysis in specific voluntary motions depends on

the proportion of the anterior horn cells which are dormant; and zero muscles are those in which all of the anterior horn cells are incapable of excitation by voluntary effort. On the other hand, the same motor units can and do discharge in response to other types of stimulation, particularly on the reflex level.

Secondary factors enter into the problem of upper motor neuron paralysis:

(1) Prolonged disuse with its associated loss of function and muscular atrophy; (2) Development of abnormal habit patterns of motion based on substitution of the stronger motions and exclusion of the weaker motions; (3) Spasticity caused by the corticospinal lesion, and which is due to the loss or inhibition of stretch, and other proprioceptive reflexes, interferes greatly with the efficiency of the remaining voluntary motion in the paralyzed patient. Clonus is a related disturbing factor on the same basis as spacticity. Disuse and abnormal habit patterns and spasticity may combine to produce contractures and deformities. Painful limitation of motion from contractures may result in still further secondary loss of motor function.

It has been possible in a large series of cases to demonstrate conclusively that the process of compensation, by which other central motor mechanisms take over function for the damaged areas, can be greatly accelerated and vastly extended through training. The development of these new substitute pathways for voluntary motion is dependent on application of new techniques of neuromuscular reeducation which can stimulate the various motor centers very strongly and thereby produce sufficient excitation at the synapses of the anterior horn cells to discharge the dormant motor units. As in the treatment of paralysis from poliomyelitis, the objective is maximal stimulation of the central mechanisms to excite the greatest possible number of motor units to activity, that is, the objective is maximal voluntary motion with each effort. As the new substitute pathways become more highly developed and the synaptic resistance in these functional pathways is reduced progressively through repeated usage, the conscious effort required to produce motion is progressively reduced. Once the substitute pathways are sufficiently developed so that they can be excited easily in voluntary effort in complex habitual patterns of motion, the restoration of motor function is permanent, particularly if these habitual patterns of motion are used in everyday practical activities.

The techniques of maximal excitation of central motor mechanisms which are capable of restoring motor function in upper motor neuron paralysis, can also reverse the secondary influences which interfere with voluntary motion. These techniques are effective in overcoming secondary disuse from enforced inactivity and exclusion of certain motions in abnormal habit patterns. It was indeed a surprise to learn that anterior horn cells which had not functioned in voluntary motion for as long as 40 years and had been lying dormant during all of that time as a result of severe upper motor neuron paralysis, still had the potentialities of function and in spite of this prolonged disuse could be reactivated and could again function efficiently in voluntary motion. This was even true of dormant anterior horn cells which had never functioned throughout the life of the individual (in our series as long as 48 years), because the injury to the corticospinal tracts occurred before or at birth. Similarly, the atrophied muscle fibers innervated by such dormant motor neurons could not only be restored to useful function in voluntary motion but could undergo hypertrophy with resumption of activity. These specialized techniques of neuromuscular reeducation, besides developing voluntary excitation of previously dormant motor units, were also very effective in bringing about voluntary inhibition of spasticity and clonus. In fact, in many cases the relaxation of spasticity resulting from application of these new methods of neuromuscular reeducation was greater and more lasting than the relaxation of spasticity produced by any of the drugs which have been tried for this purpose. Furthermore, with repetition of these techniques in daily therapy, new pathways for central inhibition of spasticity have been developed which eventually eliminated the spasticity through restoration of central inhibition. In other words, whereas a drug which blocks the myoneural junction has merely a temporary effect in relaxing spasticity with little or no lasting benefit, the relaxation of spasticity through development of pathways for central inhibition has both an immediate and a lasting effect. Besides, the relaxation of spasticity is accompanied by facilitation of voluntary motion whereas many drugs, while they decrease spasticity, unfortunately also result in depression of neuromuscular function with weakness and fatigue of voluntary motion. There is, of course, no contraindication to the combination of drug therapy and neuromuscular reeducation for relaxation of spasticity.

PRINCIPLES OF THERAPY OF UPPER MOTOR NEURON PARALYSIS

The mechanisms in the central nervous system which direct and control the activity of the motor

units are much more complex and variable in function than the "final common pathway." There is also extreme gradation in complexity from the simple reflex arc to skilled voluntary motion. It is evident that one must understand the central mechanisms for voluntary motion which control the firing of the interior horn cells since these processes are the most important and fundamental for neuromuscular reeducation. The characteristic physiology of the central motor mechanisms is very different from the simple "all-or-none" character of the peripheral motor unit mechanism.

Voluntary motion is often conceived of in terms of impulses starting in the motor cortex, passing down through the corticospinal tract, and, after crossing to the opposite side, passing across several synaptic junctions in the internuncial switchboard to excite the synapses on the anterior horn cells sufficiently to stimulate these neurons to discharge and produce contraction in the associated muscle fibers. This conception is definitely an oversimplification and abstraction. Even simple elementary voluntary motion such as flexion of the elbow involves much more complex mechanisms at various levels of the brain and spinal cord, including both motor and sensory systems. For example, not only is the corticospinal system active in such a simple voluntary motion, but impulses also pass from the cerebral cortical areas through the pontine nuclei to the cortex of the opposite cerebellar hemisphere and through the cerebellar nuclei to relay back to the cerebral cortex and also through the rubruspinal tract to discharge impulses down to the anterior horn cells. This large and complex motor mechanism is responsible for coordination of voluntary motion. With a deficiency in its function, instead of a smooth voluntary contraction, there would be tremor, dysmetria and other disabling defects in voluntary motion. Voluntary motion is also dependent on the proper functioning of postural mechanisms which influence muscle tonus and vary in complexity from the simple spinal two-neuron-arc stretch reflex, through more complex reflexes at the brain stem level concerned with righting and equilibrium to the higher center control of these mechanisms, largely of an inhibitory nature. An elementary voluntary motion probably also involves activity in the basal ganglia and is controlled by proprioceptive sensory impulses at the conscious as well as the reflex level. Furthermore, even a simple voluntary motion involves not only contraction of the prime mover but also reciprocal inhibition of the antagonist muscles and activity in fixator and synergic muscles. Besides the functioning of apparently unrelated parts of the nervous system such as those relating to special senses, various aspects of mental function and emotional expression obviously have an influence on voluntary motion. In other words, while particular motor mechanisms have a direct role in initiating and controlling voluntary motion, the function of the entire nervous system is involved in an interplay of influences that affect the process.

The interaction of different motor centers at various levels in voluntary motion should be clear enough from the fact that a simple interplay of centers is involved in even the simplest reflex activity. It has been known for a long time, for example, that the simplest known reflex, the two-neuron-arc knee jerk is influenced by various higher centers including the vestibular mechanism at the medullary level, by voluntary motion such as clenching the fist, and even by a mental process such as solving a problem in arithmetic. It is evident from this discussion that the simple reflex arc and the simple voluntary motor pathway are both oversimplified abstractions. In actual function, the various centers and pathways of the motor system all play a role and influence the process of voluntary motion in a complex, closely interrelated manner.

The characteristic functioning of the central motor mechanisms can be illustrated by the gradation in strength of voluntary contraction of a muscle from minimal to maximal contraction. The determining factor in the percentage of motor units excited is the level of excitation at the synaptic endings of the anterior horn cells. With slight voluntary effort to contract a muscle, the excitation at the synapses of the anterior horn cells is also slight and while excitation is built up at many anterior cells, at only a few does the level of excitation reach the threshold in order to discharge the motor unit. At other anterior horn cells, the excitation is below the threshold level and no response occurs. As voluntary effort is increased, excitation spreads to a larger number of anterior horn cells and while many motor units do not discharge because the excitation is below threshold, a greater number of motor units are excited. In free voluntary motion with gravity eliminated, no matter how strong the effort of voluntary contraction, a considerable percentage of the motor units cannot be excited because the synaptic excitation remains below threshold. With the addition of resistance, the excitation builds up to a higher level and a large proportion of the motor units are activated as synaptic excitation builds up to threshold level at many more anterior horn cells. Still greater

(Continued on Page 27)

PEARL MITCHELL

The membership of our Association will be saddened to learn of the death of Mrs. Pearl Mitchell, Corrective Trehapist, The Veterans Administration Hospital, Murfreesboro, Tennessee. Mrs. Pearl Mitchell was a noble person of great energy who was able to transmit fine qualities of character into the every day task of working along with sick people. The respect and love of the patients towards her became reflected in unusually favorable results. Visitors to this hospital along with consultants and other notable figures in the field of psychiatry were so much impressed with her methods that commendations were sent to Central Office and on one occasion the Medical Director of The American Psychiatric Association praised her before a meeting of the National Consultants to the Veterans Administration.

We believe that no finer tribute to Mrs. Mitchell can be given by this Association, of which she was a member, than to repeat here the story of one of many of the patients she assisted along the hard road to rehabilitation, a task to which she was singularly devoted.

J. E. Date of Case Study, January 5, 1950, white, male, WWI patient, Diagnosis: Dementia Praecox, Hebephrenia, was transferred to Murfreesboro, Tenn. after hospitalization of seventeen years duration. From the first day of his admission to his arrival in Murfreesboro he had been hospitalized continuously on a closed ward and showed no improvement, mentally or physically. He had reached the stage of vegetative existence. Early in 1947 corrective therapy was prescribed for him, and he entered the Habit Training Group, where he was taught to participate in an active program, consisting of brushing teeth, lacing shoes, wearing socks, keeping buttons fastened, wearing a belt, keeping nails clean and filing them with an emery board, using knife and fork, holding up by handle correctly, proper use of napkin and brushing hair after using a pomade.

It must be remembered that he was for many years very dull, inert, regressed, deteriorated, out of contact with no insight. In easy stages he was incorporated into the gymnasium class and began his therapy by use of wall pulleys. For several weeks he operated them with one finger only. After he made satisfactory progress, he was promoted to the small group where he worked with rubber balls, first large, then small. Considerable mental improvement was shown and he participated further in Corrective Therapy activities such as bus rides, outings off the Station, therapeutic walks to farms and gardens, inspecting livestock, identifying various crops and other growing things, all the while working daily for one or two hours in the gymnasium. During this time he was usually mute, but occasionally broke forth in word salads. He was at all times agreeable, but largely disinterested in any form of therapy. Gradually, he began to show marked interest in all activities, participated remarkably well for one who had been inactive for so many years, and upon the visit of his sister, it was suggested that a trial visit be arranged. He has been at home with his sister since June 8, 1949. Her most recent letter advises us that he has continued to improve and is making a very satisfactory adjustment. She says, with some pride, that his table manners are very satisfactory, that he says "Please" and "Thank You" for every favor, that a few weeks ago he requested that she permit him to accompany her to church, and that he has been continuing to attend since that time.

"What they have lost is in their past. Our job is to help them make a future of what they have left." This precept, often applied to the rehabilitation of the physically ill is also applicable to the problem of social reeducation of the mentally sick. Mrs. Mitchell's work embodied this principle with all the self sacrifice of a noble person. No case was too hopeless, no task too hard but that she would give forth her very best ability to help. Having great faith in human beings, she soon learned that patients found faith in her and would respond to her efforts even though their response might be crude and wavering. Many are living happier, more productive lives because she lived and gave them her great kindness and goodness of heart. The Association of Physical and Mental Rehabilitation is thankful that such personalities become attracted to the field of medical care and treatment. It is from them that we are able to gain much of the finer concepts of therapy.

BOOK REVIEWS

HANDBOOK OF PHYSICAL MEDICINE AND REHABILITATION, by the Council on Physical Medicine and Rehabilitation of the American Medical Association and 29 contributors, 573 pages; April 1950. Price, $4.25.

Because of the change in title and the inclusion of rehabilitation this becomes the first edition instead of the fifth revised edition of the Handbook of Physical Medicine. The addition of "rehabilitation" broadens the scope of this book and brings under consideration all the medical, phychological and social services whereby a person recovering from disease or injury is taught to live, and if possible to work with what he has left.

The various methods in Physical Medicine are described. A discussion of Physical Medicine in the treatment of fractures, poliomyelitis, psychiatric problems, skin diseases, opthalmic disorders, problems of hearing, and in peripheral vascular diseases is included.

Of special interest to all Corrective Therapists is the chapter written by Dr. E. C. Elkins on Therapeutic Exercise: A Few Basic Principles. Dr. Elkins discusses the use of corrective exercise and their application in the treatment of disease or malfunction. Also of interest is another contributor, Dr. D. G. Wakim on the Physiologic Aspects of Therapeutic Exercise.

EVALUATION OF INDUSTRIAL DISABILITY by Thurber Packard, M.D. Published by the Oxford University Press, 114 Fifth Avenue, New York 11, N. Y.

In an abundantly illustrated text, this book affords a standard method for measuring and reporting restriction of joint movement in industrial and other injury cases. Developed by a Committee of the California Medical Association and the Industrial Accident Commission of the State of California, this text provides all industrial physicians and surgeons with the means to make to accident commissions uniform reports based on a standard procedure.

The book is invaluable to all interested in the measurement of physical disability in accident and injury cases, including public industrial accident and compensation personnel, industrial medical and health departments, lawyers engaging in compensation practice and in certain types of negligence and claims work, accident and casualty insurance companies, self-insurers, physicians and surgeons encountering physical disability resulting from accident and injury and in special respects, corrective therapists, orthopedists, anatomists and physical education students.

Evaluation of Industrial Disability embodies the standard and official procedure of the State of California. Once and for all it clears up the delays, conflicts and confusion incidental to miscellaneous unintegrated methods of measuring and evaluating measurement of joint function.

Contents include: General instructions—Anatomical Position — References — Instruments — Fundamentals of Reporting Motions — Subjective Complaints — Normal Ranges of Motion — Grasping Power — Abnormalities and Deformities — Neck — Spine — Upper Extremity — Lower Extremity — Special Disabilities: Eye, Ear, Head, Mental.

—L. B.

ANALYSIS OF FACTORS CONCERNED IN REGULATION OF BREATHING IN EXERCISE, by Fred S. Grodius. *Phychological Reviews*, 30:220-39, April, 1950.

Regulation of respiration during exercise depends upon alterations in the activity of the medulla respiratory centers in response to stimuli reaching them via neural or humoral pathways. Alterations in the established humoral chemical agents, carbon dioxide tension, hydrogen ion concentration and oxygen tension of arterial blood, cannot alone account for the hypernea of exercise. Among other reasons the maximum ventilation produced by them is much less than that produced in exercise, and the relationship between ventilation and oxygen consumption in such case would be different from that actually observed in exercise. It therefore becomes necessary to postulate the existence of an additional mechanism. The available evidence indicates that it is additive in nature, leaving the sensitivity of the respiratory mechanism of the chemical agents unchanged. Nerve section experiments, vascular occlusion experiments, and passive exercise experiments so far reported do not provide identification of the pathway which it travels. While no conclusion can be drawn as to the nature of this mechanism, it is suggested that the role of the rise in body temperature during exercise merits careful study. —P. J. R.

NEWS AND COMMENTS

California Chapter News

The Chapter conducted a symposium on Multiple Sclerosis on December 19, 1950 and it was held at the Cedars of Lebanon Hospital, Hollywood, California. The following invited speakers covered the field of Multiple Sclerosis from every medical aspect. Dr. J. J. Karpeles, Director of the National Multiple Sclerosis Society oriented the group with a talk on "The National Multiple Sclerosis Society." Dr. Tracey J. Putnam, Chief Neurosurgery, Cedars of Lebanon Hospital and Chairman, Medical Board of the National Multiple Sclerosis Society followed with a lecture on the "Medical Aspects of Multiple Sclerosis." Dr. Eugene Ziskind, Chief, Neuropsychiatris, Cedar of Lebanon contributed to the symposium with a talk on the "Psychological Aspects of Multiple Sclerosis." The symposium was completed with the topic "New Trends in the Treatment of Multiple Sclerosis" delivered by Dr. John H. Aldes, Director of Rehabilitation and Physical Medicine Cedars of Lebanon Hospital.

Recalled to Active Duty

Mr. Robert Kramer an active member of the Association, and Corrective Therapist at the VA Hospital, Sheridan, Wyoming has been recalled to extended active duty. Bob informs us that he will be performing corrective therapy and reconditioning duties in an Army hospital.

Mr. Lawrence E. Schipper of Dwight, Illinois has also received his "recall" to active Duty. Good Luck, Lawrence. Our Journal will keep you informed wherever You may be.

Appointments

Dr. William W. Fellows, Chief of the Surgical Service at the Aspinwall, Pa., VA Hospital, has been appointed as manager of the 1,005 bed VA Hospital now under construction. The hospital is scheduled to take its first patient in March 1951.

New York Chapter News

Mr. Wendell Browne, pro tem, presided at the second business meeting of the New York Chapter, held on October 28, 1950 at the Hotel New Yorker, New York City. A number of items relating to organization was discussed and passed on. Several committees were named. The Speakers and Meeting Committee was charged with the function of selecting, inviting and arranging for a group of noted speakers to appear at the next quarterly meeting to be held on January 20, 1951 at the Hotel New Yorker, NYC. The above committee is composed of Mr. Frank Chilletti, Mr. Arthur Tauber and Mr. John Halbin. The Constitution and By-Laws Committee who have Mr. Edward Friedman, Mr. Leo Berner and Mr. Sam Boruchov as its members, will report their findings and recommendation at the next Chapter business meeting.

Mr. Leo Berner brought to the attention of those present the "Corrective Therapy Registry" problems as were discussed at the Congress of Physical Medicine Convention in Boston, Mass. Mr. Berner also spoke about the Douglas Bill, wherein it recognizes the efforts and services of Corrective Therapy.

Matters of national importance were brought to the attention of the New York Chapter by Mr. Sam Boruchov.

Accepted Paper

Dr. Alfred Kamm, a member of our Association, helped write the report entitled *The Mental Health Programs of the Forty-Eight States.* It was recently published by the Council of State Governments, 1313 East Sixtieth Street, Chicago 37, Illinois. The report is a survey of all state mental health programs and state mental hospital conditions. All aspects of their care and treatment programs are covered, including activity therapy.

Dr. Kamm has been executive secretary of the Montgomery County Mental Hygiene Association, Dayton, Ohio, since May 1, 1948, when the Association was established. The Association granted him a leave of absence for this special project. He received his doctor of education degree from New York University in 1944. His doctorate dissertation was *A Manual of Activity Therapy for Mental Hospitals.*

Activities for Schizophrenia

Filmed at the Neuropsychiatric Hospital, Los Angeles, California

As a part of a new program to aid in reclamation of the mentally ill, a motion picture, based on cold science but with warm Hollywood overtones, has been produced.

Made under Veterans Administration auspices, it will combine a human message with a technically accurate portrayal of treatment methods. The motion picture emphasizes Corrective Therapy and the dramatic results obtained by specialists in this professional field, and tells the case history of an actual young veteran who became a victim of schizophrenia, which is the most common of the 21 major types of mental illnesses.

The picture was directed by Dan Milner, whose previous Veterans Administration film, "Journey Back," has been nominated for an Academy of Motion Picture Arts and Sciences Special Award. Mr. Milner's cast for this film includes two professional players, with other characters chosen from the Neuropsychiatric Hospital staff at Los Angeles. Lois Moran, actress, who has been active in Corrective Therapy work at this hospital, takes the part of a nurse. The leading man is Robert Einer, who portrays the veteran patient. Murray Levitta, Chief of Corrective Therapy at Wadsworth General Hospital in Los Angeles portrays the Corrective Therapist.

Hollywood studios and technicians aided in the production. Dr. Davis, our own Chief of Corrective Therapy in Central Office, was Technical Advisor, and Burr S. Zachary, Chief of Corrective Therapy at this hospital, was Production Manager.

Tentative plans for this film include a nationwide television showing in all major cities as well as full coverage of all Veterans Administration, Army and Navy Hospitals. The Neuropsychiatric Physical Medicine Rehabilitation Service plans to show the film to the faculty of the University of California at Los Angeles School of Medicine and the University of Southern California School of Medicine.

The California Chapter of The Association for Mental and Physical Rehabilitation is formulating an extensive schedule to show the film to all organizations interested in rehabilitation.

Full War-Time Benefits

American service men fighting in Korea are entitled to full war-time benefits. They include: disability benefits at war-time rates; death compensation at war-time rates (peace-time rates are 80% of the war-time rates); waiving of NSLI premiums in case of injury or disease traceable to extra hazards of service.

The Douglas Bill to Aid the Disabled

Last September the Senate passed the "National Services for Disabled Persons Amendments of 1950." The bill, which will now go to the House of Representatives, was drafted by Senator Paul Douglas of Illinois and nine other Democratic and Republican Senators after extensive hearings by the Senate subcommittee on Vocational Rehabilitation.

The bill provides that the disabled persons requiring only job counseling and placement services are to receive such services from Federal and State employment services rather than from rehabilitation agencies. This not only eliminates duplication, but is a step forward, as some state rehabilitation agencies have concentrated on the less difficult cases requiring only counseling and placement at the expense of the more difficult cases of the severly disabled who require extensive service. Other new provisions permit Federal grant-in-aids for the first time for vending stands for the blind, adjustment training services for the blind, auxiliary services in workshops, for severely disabled persons, employment programs for the home-bound, and assistance to the severly disabled in establishing small businesses. Authorization is also provided for grants-in-aid for rehabilitation centers. (Note: Corrective Therapy is recognized as an integral part of the rehabilitation center, see page 44 of the Senate Bill 4051) and workshops for the severely disabled, grants for research and adjustment centers for the blind, loans to states and grants for research and training.

It is suggested that all members write to Senator Paul Douglas, The Senate, Washington 25, D. C., for a copy of the Senate Bill No. 4051. It is to the interest of each individual and to the field of Corfective Therapy that every member know the contents of the bill to help the disabled.

PLEASE NOTE

It is urgent that I receive back issues of our Journal of the following dates: August-September ('49), October-November ('49), December ('49), January ('50), February-March ('50).

Please forward copies to editor. Thank you.

Committee Report Veteran Medical Services

In a report to President Truman, the three man committee of Dr. Howard Rusk, Dr. Arthur Abramson, both of whom are members of the Advisory Board to the Association for Physical and Mental Rehabilitation, and Dr. Robert Dennison, reviewed the entire VA Hospital program and made numerous recommendations for its improvement.

1. Clarify VA hospitalization for non-service connected veterans.
2. That the Defense Department defer from active duty all VA physicians.
3. That the VA cease its policy of issuing layoff notices to medical employees.
4. That the geographic location of VA hospital beds be improved.
5. That military casualties unfit for further duty be transferred to VA facilities.
6. That "intermediary" hospitals be established within the present VA system.

The committee stated that the present authorized ceiling of 131,504 beds are completely adequate to care for all forseeable service connected disabilities in the present veteran population. They added that it was doubtful if even the present total of beds could be properly staffed. To alleviate such a situation the committee recommended:

1. The Armed Forces do not mobilize professional personnel now employed by the VA.
2. Increased security by developing long term policies and avoidance of radical budgetary fluctuation.
3. Replacement of certain hospitals with new hospitals and taking into account the concentration of veteran population, geographic distribution as it pertains to morbidity and mortality, and sources of medical personnel to be near medical centers, universities and concentration of population.

The committee also recommended:

1. That a delayed plan of closure of temporary VA Hospitals due to the present emergency, be developed.
2. Reorganize the administrative structure of the Medical section of the VA.
3. Further expansion of the vocational rehabilitation job placement, and home employment for paraplegics.

The committee reported the care of the veteran suffering from mental ailments posed the biggest problem because of the lack of trained medical personnel in the field. And that in their opinion the VA be commended on its medical, Physical Medical Rehabilitation and prosthetic services to the amputee veteran.

CONVENTION PLANS

Mr. Allen K. Pollock and Mrs. Nina McGovern of the Convention Section of the Los Angeles Chamber of Commerce have pledged assistance for the coming convention to be held July 3rd, 4th, 5th, and 6th, 1951. Secretarial assistance has been offered plus printed matter which will be in the hands of the prospective delegates long before convention time. This material will give the necessary information desired before arrival in California.

Mr. Newman Tucker, Public Relations Manager for the Hollywood Roosevelt Hotel, has been most enthusiastic in his invitation to the Association members. The Hotel, which is centrally located in Hollywood, will be a refreshing environment for all who plan to attend the convention. The management boasts of a new million dollar addition that has every modern convenience for the delegates' comfort, including an outdoor pool.

Information on methods of travel and interesting scenic routes on this western tour will be covered in future issues of the Journal and Newsletter.

A suggestion for the most economical means of travel would be sharing rides by automobile and utilizing motel accommodations. This is probably the best method for seeing the country, if time will allow. For quick travel, luxury airliners or streamlined trains will be the answer.

Plan Now To Attend The 1951 Convention in Los Angeles.

The NRA Convention in New York

The National Rehabilitation Association Conference was held at the Hotel Statler, New York City, from October 23 through 26, 1950. The purpose of the Conference is to bring before the public of the United States its obligation to recognize the desire and rights of all people, no matter how seriously handicapped or disabled, to contribute to the social and economic well being of their community by earning a self-respecting livelihood. Further, it is the additional purpose of the Conference to put emphasis on the necessity for cooperation and teamwork between all persons and agencies giving rehabilitation service.

One of the outstanding concepts of the convention was given in a speech by Dr. Josephine J. Buchanan, Chief of Physical Medicine Service, Gallinger Hospital, Washington, D. C., who said at the Rehabilitation Center session, "In the past, medicine was the chief source of all healing. With recent knowledge and skills we are changing the total philosophy. The physical being of the individual should be planned medically, in accordance with the vocational and social view."

excitation can be achieved through summation of several facilitating mechanisms so that more anterior horn cells discharge and a maximal response can be obtained. In fact, temporal and spatial summation have been shown to be an extremely important factor in determining the quantity of excitation, both in reflexes and in voluntary motion.

Besides the quantitative gradation in excitation at the synapses of the motor neurons which is related to the strength of contraction of the muscle in voluntary motion, there are important inhibitory influences which greatly affect the quantity of excitation and the actual discharge of the motor units. These inhibitory influences come from activity in motor centers at various levels in the spinal cord and brain and converge on the final common pathway. Summation is also a significant factor in inhibition as well as in excitation. Aside from motor centers, inhibitory influences on voluntary motion can also arise from other central mechanisms. For example, it is well known that a new habit pattern of walking is easily disturbed by the person becoming aware that he is being watched. In this example, inhibitory influences from emotional centers decrease the level of excitation at essential synapses of the voluntary motor pattern. The quantity of excitation in the various motor centers is therefore dependent on the interplay of excitation and inhibition from a number of sources, on summation of excitation and summation of inhibition, and on the quantitative relationship of excitation and inhibition at the synapses of the motor neurons. Besides these factors, there are other variables which determine the quantity and character of activity in the motor centers, such as the state of fatigue in the specific synapses at the moment, and the chemical and ionic environment of the neurons such as supply of glucose and tension of oxygen and carbon dioxide.

(To be concluded in the next issue of the Journal)

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Application For Active Membership

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FORMAL EDUCATION .....
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TRAINING IN PHYSICAL REHAB. .....

.....

EXPERIENCE IN PHYSICAL AND/OR MENTAL REHABILITATION .....
(Required—One Year Under Direct Supervision of a Doctor of Medicine)

CONTRIBUTION .....
i.e. Publications, Studies, Surveys or Research in the field of Physical or Mental Rehabilitation

REFERENCES: 1. .....
Name Position Location

2. .....

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Signature of Applicant

NOTE: REQUIREMENTS LISTED ABOVE ARE FOR ACTIVE MEMBERSHIPS

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